

**INDUSTRIAL ENVIRONMENTAL PERFORMANCE
MEASUREMENT & DISCLOSURE:**

**INFORMATION FOR A CLEAN REVOLUTION
IN SOUTHEAST ASIA**

**A Framing Paper
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Foreword

The U.S. Agency for International Development's United States - Asia Environmental Partnership (U.S. AEP) has commissioned a series of framing papers to help define a research and policy agenda that will support the movements towards a "clean revolution" in Southeast Asia. A "clean revolution" is defined as a mode of continuing socio-economic development that reduces or at least minimizes environmental impact. In recognition of industry's leading current and future role in economic development in Southeast Asia, U.S. AEP's efforts are focused on industrial development and its environmental impacts.

One basic premise of the framing papers is that accurate, relevant, and timely information (of many different kinds) is necessary for good governance, good business decision-making, and equitable public participation and oversight. In the United States, President Clinton and Vice President Gore, have repeatedly stated their belief that the "power of information" can play a significant role in improving environmental quality in the U.S. (Konar & Cohen, 1996). Some in industry agree, as typified by the following quote concerning the pollutant emissions information contained in the U.S. Toxics Release Inventory (Working Notes - May/June 1995):

"It's not necessarily that we didn't want to [reduce emissions] before. We never had the information we needed to know if progress was being made."

(Steven Schoger, BP Chemicals (Cleveland, Ohio), Occupational Hazards, July 1991)

Accordingly, this paper will focus on Industrial Environmental Performance Measurement (IEPM) information as a driver for promoting improvements in industrial environmental performance, as a tool for sound policy formulation and program design, and as a tool for measurement and dissemination of policy and program success. The multiple stakeholders for IEPM information include government (see the Policy framing paper), industry business partners such as suppliers, customers, and the financing community (see the framing papers on Globalization and Technology Change), and the general public (see the framing paper on Civil Society).

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Asia has experienced a remarkable transformation in the past three decades. Prior to the current economic crisis, the World Bank projected that Asia would continue to experience more rapid economic growth than most other regions and that by 2025 Asia's share of world GNP will have risen to 30 percent (Kato - 1996). With a small number of exceptions the manufacturing sector has been the driving force behind the economies in the region.

The accuracy of rapid growth projections in Asia has been called into question by the economic crisis, and certainly for the short term, growth rates in the adversely affected economies can be expected to be quite modest. However, the long-term outlook may not be dramatically altered. In the May of 1998, IMF staff predicted a slow rebuilding of confidence during 1998, followed by a modest return of growth in 1999 and a solid recovery by 2000 (IMF - 1997). Provided this holds true, long-term growth rates will possibly match projections made in advance of the crisis.

It is very important to note that industrial presence and economic performance varies widely between countries in Asia. However, it is possible to make some general observations about four distinct regions of Asia: Japan; South Asia; East & Southeast Asia; and China (UNIDO - 1995). The main focus of this framing paper is Southeast Asia, although lessons for the region will be drawn from examples in other parts of Asia and the more developed countries, with which the open economies of Southeast Asia necessarily interact.

The region of East & Southeast Asia actually includes two sub-groups that have followed somewhat different time frames for development, with similar patterns. The First Tier Newly Industrialized Countries (First Tier NICs), which include Singapore in Southeast Asia and Hong Kong, Taiwan, and Korea in East Asia, were the first to enjoy rapid increases in economic prosperity. They have been followed by the Second Tier NICs of Southeast Asia, the most prominent of which are Thailand, Indonesia, the Philippines, and Malaysia. The original export-led development strategy of the First Tier NICs relied on labor-intensive products. With the emergence of the Second Tier NICs as new low wage competitors, the First Tier NICs have altered their strategies and are now producing goods from more capital intensive industries.

Unfortunately, the economic performance of the even the most miraculous of the Asian economies is tempered by a dismal environmental record, and the region is facing a wide range of environmental problems (ADB - 1997; Global Environment Monitoring System - 1996; World Bank - 1995; WRI - 1996). The rapidity of the economic growth rate growth has exacerbated the environmental difficulties because regulators have had to deal with independent problems either simultaneously or in rapid succession (O'Connor - 1996).

Water pollution generally is recognized as the most serious environmental challenge facing Asia, both in terms of its current impact and its projected clean-up costs (Brandon and Ramankutty - 1993). The water pollutants traditionally of most concern include suspended solids, fecal coliform, biological oxygen demand, nitrates, and lead, and the three main factors that have lead to water pollution include domestic sewage, industrial effluents and run-off from activities such as agriculture and mining. Of the three, domestic sewage is the chief culprit. However, as industry has developed in highly polluting sectors such as chemicals, electronics, electroplating and machinery, increasing attention is being given to toxic materials found in industrial wastewater, such as heavy metals and persistent organic chemicals.

The generation and disposal of toxic and otherwise hazardous materials is of particular concern in countries where manufacturing industry is a growth sector. Unfortunately, nearly three-quarters of Asia's toxic and hazardous waste is pumped into the ocean or dumped into landfills. The remaining (approximately) one quarter of Asia's toxic and hazardous waste is treated chemically or incinerated, often without adequate safeguards, if they exist at all (ADB - 1997); incineration by-products contribute to the air pollution load.

The more traditional air emissions of concern include sulfur dioxide, particulates, carbon dioxide, and lead. Emissions of all but lead are strongly related to increased energy consumption, particularly in countries where coal is the primary fuel. Between 1975 and 1990, the developing Asian economies increased their share of world primary energy consumption from 8% to 15% (Akiyama & Ishiguro - 1995). The industrial sector generally accounts for the highest share of final energy consumption, with the exception of Thailand, where transportation is the largest energy consumer. The industrial contribution to air pollution in Asia also is heightened by the expansion of the iron, steel, fertilizer and cement industries.

Land degradation impacts of concern in Asia include deforestation, soil erosion, waterlogging and salinization, desertification, and imperata spread. For example, deforestation in South East Asia, the reasons for which vary between region and country, has led to the deterioration of watersheds, changes in water run-off, and sediment transport. Industry contributions to deforestation include logging and agrobusiness encroachment (Rigg - 1995).

Fortunately, awareness in Asia has been growing regarding the constraints and costs that environmental degradation can impose on a country's economic and social development. To restate, awareness has been growing of the benefits that can be gained from sound environmental priorities and management. In response, a variety of regulatory and other instruments have been developed to reduce the negative environmental impacts of industrial development in Asia. Regulatory practices in the region vary but the main approaches have been Command and Control (CAC) regimes. CAC regimes mainly are based on ambient stream standards, which provide the general goals, and are supported by emission and effluent standards established by a relevant government agency. Industrial firms are expected to comply with these standards and failure to comply are supposed to (and sometimes do) result in fines, imprisonment or closure.

Countries such as Singapore and Hong Kong have progressed rapidly and their legal and regulatory institutions have expanded with them. In contrast, in more slowly developing countries such as Lao PDR and Myanmar, environmental legislation and regulations are relatively rudimentary. The success of the regulatory approach to controlling industrial pollution also has varied from country to country. Singapore, for example, has experienced great success reducing industry's environmental impacts by thoroughly integrating environmental policy with industrial policy from the beginning of its industrialization process (and backing the policies with strong enforcement). Unfortunately, in many other countries in Asia, the CAC approach to reducing industrial pollution generally has had only limited success in controlling industrial environmental impacts, for a number of reasons.

The main cause for ineffectiveness is often government's failure to coordinate objectives and policies. Development and environment agencies tend to separately pursue their respective goals and mandates, which conflict in many areas. Moreover, the environment authority is often bestowed with planning more than implementing environmental measures. For example, in Thailand the prior right to act in the case of industrial pollution is vested in the Ministry of Industry. According to the country's environmental law, the Environment Ministry will only act if needed activities are not forthcoming by the Ministry of Industry. In addition, government agencies often do not have the necessary resources (financial and human) for adequate environmental monitoring and enforcement.

The inadequacies of CAC regulation in many countries has opened the door for the consideration of alternative economic instruments, including economic incentives such as custom exemptions on the import of clean technologies and economic disincentives such as environmental taxes and fines, and pollution levies. Economic instruments are not new for Asia but they are employed primarily in the natural resource sector in the form of land taxes, forest concessions, fees and charges; economic instruments for industrial environmental management are being utilized predominantly on an experimental and small-scale basis. They are primarily applied as end-of-pipe solutions and are designed to support existing regulations, and fines and charges are often too low to motivate polluters to modify behavior.

Social instruments also can be utilized to influence industries to improve their environmental performance. This refers to the pressure that the public can exert on firms whose activities are adversely impacting their local environment. Depending on the level of public participation, local communities can provide strong incentives for industrial firms to abide by the law and meet (or occasionally surpass) the standards established by the State. Conversely, social Instruments can encourage environmentally responsible behavior on the part of firms via recognition and approval of their positive environmental performance.

For social instruments such as public pressure to be effective in promoting better environmental performance on the part of industry, the public must be provided with relevant, accurate, timely, and understandable information on industry activities and the potential or actual environmental impacts of those activities. Indeed, such information is necessary not only for effective public participation and oversight but also for good governance and good business decision-making. For example, from a business decision-making standpoint, Industrial Environmental Performance Measurement can be an invaluable tool for characterizing the (often surprisingly high) total costs of converting raw materials into pollution rather than product. From a governance standpoint, such information is a critical planning tool.

Accordingly, this paper will discuss on Industrial Environmental Performance Measurement (IEPM) as a tool for sound policy formulation and program design, and as a tool for measurement of policy and program success. A particular focus will be given to Industrial Environmental Performance Measurement and Disclosure (IEPMD) as a driver for promoting improvements in industrial environmental performance. The multiple stakeholders for IEPM information include government, consumers and other members of the general public, the environmental NGO community, industry employees and management, and industry business partners such as suppliers, customers, and the financing community. The level of information disclosure by industry and the mechanism for disclosure varies for the different audiences.

Performance based Measurement, transparency and accountability have not been the norm in Asia. In order to frame a thoughtful approach towards assessing the potential value of IEPM in Southeast Asia, and considering practical implementation steps, this paper first will first set the stage with an introduction to IEPM and industrial environmental improvement indicators (IEPIs) in Chapter II. Chapter III reviews select IEPM programs and mechanisms currently in place in Asia and elsewhere, that can provide lessons for future efforts in Southeast Asia. Chapter IV discusses specific economic, political, and societal conditions in Asia that have practical implications for IEPM, both positive and negative. And finally, Chapter V outlines some general recommendations for the development of IEPM systems in Southeast Asia.

II. Industrial Environmental Performance Measurement and Indicators

Industrial Environmental Performance Measurement (IEPM), in its broadest sense, is *the assessment of industry activities, processes, and products that have a potential environmental impact*. For the purposes of this paper, the term “environmental impact” encompasses the full range of potential impacts, including: ecosystem degradation or destruction from resource extraction; depletion of scarce or non-renewable resources; and the pollution of air, water, and land with resulting human health and ecosystem health impacts.

1. General Uses of IEPM Information

IEPM information is valuable to many different stakeholders with an interest in various aspects of industrial environmental performance. These stakeholders include:

- Industrial Facilities/Firms themselves (manufacturing, resource extraction, service sector)
- Industry's Business Partners (e.g., suppliers and customers from other firms and sectors, insurance providers, banks and other finance providers)
- Government (e.g., environmental agencies, development agencies, local government)
- The Public (e.g., consumers, local communities, environmental NGOs)

The different stakeholders will be interested in a variety of different types of IEPM information for different uses. However, in general terms, IEPM information can be used in the following ways:

- As a driver for promoting better environmental performance

The availability of IEPM information both within firms and externally to the broader community can drive performance improvements. Internally to the firm, IEPM information often illustrates the costs of inefficiency and waste, and can trigger voluntary action to make material, process, product, technology, and behavioral changes that both lower costs for industry and benefit the environment. The disclosure of IEPM information to parties outside the firm can trigger a demand for better performance from communities that host facilities, consumers who buy the firm's product or service, investors who buy company stock, government agencies, and business partners such as banks, insurance companies, and suppliers.

- As a tool for policy formulation and program design

Government is one clear beneficiary of timely, accurate IEPM information. Government agencies and ministries with responsibility for industrial and environmental policy and programs need IEPM information to set priorities for their limited staff and budget resources, to inform policy decisions, and to support the design of programs for policy implementation. Similarly, industry and its business partners can use IEPM information to set their own policies, programs, and practices.

- As a tool for assessment and dissemination of policy or program success, and for monitoring compliance with regulation, formal commitments, or multi-party agreements.

As a logical follow-up to IEPM information first as a driver of action and then as a policy and program design tool, the final general use for IEPM information is as a tool for assessment of results. Companies can use it to assess the success (or failure) of their voluntary programs and to demonstrate compliance with environmental regulation. Industry's business partners in the financing community can demonstrate environmental commitment and attract socially conscious investors by assessing the potential environmental performance of industry projects they fund. Government can assess the success of its policies and programs, can demonstrate the efficacy of those programs to a concerned public, and can track progress towards meeting the goals of regional or international environmental agreements (Ausubel & Victor - 1992).

2. An Introduction to Industrial Environmental Performance Indicators (IEPIs)

A good starting point for thinking IEPIs is a framework developed by the Organization for Economic Cooperation & Development (OECD) for the broader universe of environmental indicators in

general, of which *industrial* environmental indicators make up only a subset (Hammond, Adriaanse, Rodenburg, Bryant, & Woodward - 1995). UNCSD adopted and broadened OECD's generally accepted approach, with some language changes.

Using UNCSD language, "driving force" indicators characterize the activity of environmental concern, e.g., the emission of particulates from the stack of a coal-burning power plant into the air. The corresponding "state" indicator describes the actual impacts resulting from particulate emissions, e.g., elevated ambient concentrations of particulate matter in the air. The final "response" indicator characterizes the response to the environmental concern, which, in this example, might include energy efficiency activities to reduce energy consumption and thus reduce particulate emissions. The final step is to loop back to the driving force and state indicators to monitor the effectiveness of the response activity.

Indicators of industrial environmental performance generally fall into the first and third of the categories described above: the driving force indicators (e.g., particulate emissions) and response indicators (e.g., energy efficiency efforts). To date, however, industrial environmental performance indicators (IEPIs) generally have *not* included state indicators that characterize the *state of the environment*, such as ambient pollutant concentrations, inventories of sustainable resources, etc. Nor have IEPIs generally included other state indicators such as the impacts on human health, e.g., the incidence of asthma cases resulting from inhalation of particulates.

There are two main reasons for the exclusion of state indicators from most existing systems of industrial environmental performance measurement. First, the actual environmental impact of a particular industrial activity partly can depend on variables out of the control of the company. For example, the actual human health impact of particulate emissions on a given day will depend on weather patterns that determine the exposure of different populations to the emissions. Second, many non-industrial factors also contribute to the state of the environment and resulting impacts. In the particulates example, other contributors might be auto tailpipe pollution, domestic heating emissions, and waste incineration emissions.

Characterization and allocation of the contributions of multiple driving force activities to the resulting ambient environmental state, and clarification of the potentially synergistic interactions among these driving force activities, has been and continues to be one of the greatest challenges in determining and implementing the best approaches to environmental improvement. However, needless to say, since the goal of industrial environmental performance measurement is indeed to improve the state of the environment, then connections must be made between industrial environmental performance and the actual impacts that result, even if those connections are not fully understood and quantified. Typically, the effort is made only by government agencies seeking a basis for setting environmental regulations and standards, or by industry facilities or sectors contesting those regulations and standards.

Even excluding the state indicators, numerous industrial environmental performance indicators (IEPIs), both quantitative and qualitative, can be envisioned for characterization of the multiple activities carried out by a single industrial firm during day to day operations. When considering the wide range of industry sectors and individual firms operating in the world today, the potential list of IEPIs becomes endless. Establishing an organizational framework for thinking about this multitude of potential IEPIs can make the task much easier.

3. Different Types of Industrial Environmental Performance Indicators (IEPIs)

A great deal of work has been done on the design and selection of specific environmental performance indicators for industrial operations (WWF - 1995; Canada NRTEE - 1996; Colombian BCSD - 1996; WRI - 1997; GEMI - 1997; BMU/UBA - 1997; WBCSD - 1998). Indicators can take

many forms. Some are qualitative (e.g., establishment of an environmental management system at a facility) but many are quantitative (e.g., mass of SO₂ emitted from a power plant stack). Quantitative measures can be absolute or normalized per unit production (or some other denominator). Some measures are monetized, i.e., expressed in terms of costs or savings, and some are weighted by risk, i.e., scaled to account for relative toxicity or other characteristic.

Although many different frameworks are available, for the purposes of this paper, IEPIs can be thought of as falling into three functional categories that emphasize the environmental management strategy, environmental management implementation, and environmental performance results, respectively, of a company (or facility or sector):

➤ **Policy & Strategic Management EPIs**

These EPIs characterize efforts and programs that a company implements in order to ensure that environmental issues receive long-term and targeted attention within the firm. Examples of policy & strategic management EPIs include: The establishment of an environmental management system; The inclusion of environmental responsibilities into staff job descriptions and reviews; The amount of funding devoted to an “environmental” research and design program.

➤ **Routine Management EPIs**

These EPIs characterize routine practices and procedures that a company institutes in order to ensure adequate and timely consideration and handling of environmental problems that may arise. Examples of routine management EPIs include: annual facility audits and corrective action; monthly management meetings to discuss opportunities for environmental improvement; daily or weekly emissions monitoring to ensure compliance.

➤ **Tangible Result EPIs**

These EPIs characterize actual results, i.e., improvement or lack thereof in an area of concern. Examples of result performance indicators for industry include: the percentage of raw materials that goes out in product; the recycled content of purchased raw materials; energy use per unit product; annual volume of air emissions; number of products that are recyclable; changes in land use practices.

Each of the three indicator types defined above can be relevant across four different areas of company or facility performance:

- Environmental performance related to *internal operations*
- Environmental performance related to *products or services* generated
- Environmental performance related to *relationships with business partners*
- Environmental performance related to *accountability*

The following matrix illustrates the organizing framework described above, with examples for a manufacturing firm.

	Internal Operation EPIs	Product & Service EPIs	Business Partner EPIs	Accountability EPIs
Policy & Strategic Management EPIs	Establishment of an EMS	Funding of a Design for Environment Program	Policy to buy only raw materials extracted sustainably; Requirement that	Policy to disclose all significant environmental issues/activities; Establishment of

			suppliers comply with environmental regulations	a data collection system for performance data
Routine Management EPIs	Annual facility audits	Scheduled review of existing products; routine review of new product ideas	Annual audit of supplier operations; Annual training of suppliers	Annual staff training in data collection and analysis
Tangible Result EPIs	Reductions in internal energy use and related air emissions; Increased recycling of materials	New products that consume minimal energy during use; Replacement of toxic components with less toxic substitutes	Increased procurement of recycled materials by suppliers	Publication of an annual environmental report; Disclosure of lobbying activities related to environment

A third dimension of this organizing framework for IEPIs relate to the potential environmental impacts of resource extraction and pollutant emissions, and the issue of resource availability, i.e., for non-renewable or conditionally renewable natural resources:

- *Pollutant Emission EPIs* that characterize the levels and risks of waste generation and pollutant emissions by industry, e.g., greenhouse gases, particulate matter, persistent organics, etc.
- *Ecosystem Stewardship EPIs* that characterize the non-pollutant environmental impacts of resource extraction activities such as logging and mining or other land use activities such as plantation cultivation, e.g., soil loss, habitat destruction.
- *Resource Consumption EPIs* that characterize the magnitude and efficiency of industry's consumption of non-renewable resources (e.g., oil and natural gas) or locally limited natural resources (e.g., water).

Manufacturing, Service, and Resource Extraction firms will have different areas of special focus along the three dimensions of this organizing framework. For example, resource extraction firms would have a special interest in Ecosystem Stewardship EPIs that characterize the potential ecosystem impacts of extraction activities. A manufacturing firm would be particularly interested in Resource Consumption Indicators that characterize efficiency of raw material use. Both resource extraction firms and manufacturing firms would be interested in Pollutant Emission Indicators. In contrast, a service sector firm with minimal manufacturing operations and direct emissions might focus less on Internal Operation EPIs and more on Product & Service EPIs or Business Partner EPIs.

Beyond industry itself, other stakeholders also will have differing priority indicators of interest. For example, the existence of an environmental management system at a facility might be quite important to a multinational customer who wants the supplier facility to proactively manage and minimize the risk of manufacturing down-time due to compliance violations. However, local residents near the facility might take little comfort in the facility's EMS if air quality suffers because of routine emissions from the facility.

4. *The Scope of Industrial Environmental Performance Measurement*

Determining the intended or likely uses of the performance information to be gathered, and by whom it will be used, is critical not only in selecting the most useful IEPs but also in selecting the measurement boundaries of interest. The figure below illustrates four categories of measurement boundaries that may be of interest to various stakeholders.

Boundary Type	Boundary Examples
Temporal	Past, Current/Ongoing, Future Trends
Geopolitical/economic	City, Development Zone, Nation, Region (e.g., ASEAN)
Natural Geographic	Watershed, Airshed, Forested Area
Industrial Ecology	Facility, Company, Sector, Product Line, Supply Chain

Different stakeholders will be interested in different indicators and different measurement scopes. For example, a national environmental agency or industrial development agency might be the most interested in the performance of one industry sector as a whole, within the national boundaries of the agency mandate. In contrast, the residents of a neighborhood surrounding an industrial facility likely would be more interested in the performance of that specific facility.

The ability to measure performance at the level of the facility and firm and then aggregate that information at higher levels is important for those indicators of interest to multiple stakeholders for multiple decision-making purposes. Many existing metrics studies, measurement programs, and disclosure initiatives do focus on measurement of industrial environmental performance at the level of the facility or company.

An example is provided by the U.S. Toxics Release Inventory (TRI), which requires individual facilities to report on the annual releases of a specified set of toxic chemicals. The facility-specific information reported is routinely aggregated and analyzed for reporting the performance of different companies and industry sectors both in the U.S. as a whole and in smaller geopolitical regions such as states or zip code areas. Local residents can assess the performance of nearby facilities. U.S. State governments can assess the relationship between industry emissions and regional environmental quality. Environmental NGOs can apply pressure on the individual companies whose facilities emit the most. The federal government can assess the effectiveness of the TRI as an alternative to command and control regulation of toxic releases.

There is currently great interest in assessing the industrial environmental performance and impacts of product lines and supply chains, both of which cut across company and sector boundaries. Just as a company might internally shift a pollutant of concern from water to air, inadvertently or otherwise, individual companies might shift environmental responsibility and impacts to other firms by, for example, outsourcing metal finishing operations to a supplier. A focus on product line or supply chain reflects a more integrated approach to industrial environmental performance measurement by setting broader "industrial ecology" boundaries around products or services and the groups of business partners that produce or enable those products or services. By elucidating the links in product and supply chains, measuring environmental performance along those chains, and encouraging or requiring joint responsibility for performance improvements, the chances for simple shifting and avoidance of responsibility can be greatly reduced.

III. Existing Measurement and Disclosure Programs

As mentioned previously, the scope and indicators chosen for industrial environmental performance measurement depend on the intended uses of the information by various stakeholders. If industry is measuring its environmental performance only for its own business decision-making purposes, disclosure to outside parties is not an issue. In this case, each company can determine its own data needs and uses and prioritize improvement activities based on its own criteria. However, if performance information is to be disclosed to external audiences, then the data needs of the intended audience become important, including issues of data format, transparency, accessibility, understandability, and comparability.

The International Institute for Sustainable Development (IISD) has referred the operation of a business in this era of growing demand for information on industrial environmental performance and its impacts as 'doing business in a goldfish bowl' (IISD, DTTI, & SustainAbility - 1993). Industry responses to external pressure from business partners, government, and the general public, all with growing environmental consciousness, can drive performance improvement efforts that can be viewed as mix of voluntary action and mandated response. Government or important business partners, e.g., a major customer or finance provider, can require action by industry, assuming that compliance assurance is effective.

Industry responses to more uncertain market forces such as consumer demand and public image are more discretionary; a firm can choose to respond by improving and disclosing performance information or choose not to respond, depending on the perceived likely market value of the response. However, because disclosure to so many parties is becoming much more common, the market links between environmental performance and profitability are becoming stronger. Improvements in environmental performance and measurement and reporting of that performance can allow a firm to keep valuable customers, maintain friendly relations with local residents and employees, obtain needed financing, develop or join strategic alliances, maintain stock value, and be competitive in green markets.

The disclosure of IEPM information by industry to business partners typically is limited to the business partner requesting the information, i.e., much of the information provided is not passed on to other parties such as the government or general public. Disclosure of IEPM information to government, for government development or environmental planning purposes, has traditionally also been restricted in many countries, i.e., not for subsequent disclosure to any other parties.

As public interest in IEPM information has risen and as the public's "Right to Know" has become a more widely accepted principle, governments that have traditionally withheld IEPM information have started disclosing that information and even mandated specific reporting programs. Increasing public interest also has encouraged voluntary disclosure initiatives such as the publication of corporate annual environmental reports, primarily by larger firms. And finally, disclosure, ranking, or other assessment of industry environmental performance information by third parties such as environmental NGOs is becoming more common.

The following chapter describes some of the more prominent examples of existing metrics studies, measurement initiatives, disclosure programs, and reporting efforts (Skillius & Wennberg - 1998, UNEP IE - 1994, WRI - 1997, WWF - 1995).

1. IEPM for Internal Use Only – Eco-efficiency & Profitability

Measurement of Industrial Environmental Performance can have some very significant business benefits for a company. For example, by monitoring the use of raw materials and the generation of

waste, a facility can begin to estimate the true cost of inefficient operations that convert valuable raw materials into pollution rather than into product. The costs of industrial inefficiency include not only the cost of wasted raw materials, but also the wasted cost of processing those raw materials into waste (e.g., energy, labor, capital) as well as the costs of waste handling and disposal (e.g., wastewater treatment, incineration, permitting and regulatory compliance activities).

Numerous companies in the more industrialized nations have realized the economic benefits of improved eco-efficiency via a preventive approach to environmental management, i.e., cleaner production. The U.S. based 3M company, for example, has saved a total of U.S. \$810 million since 1975 via its "Pollution Prevention Pays" program. Numerous firms in Asia have also reaped the financial benefits of cleaner production. For example, cleaner production assessments in the Philippines at over 100 industrial facilities resulted in an average reduction in waste of 30%, with an average financial payback of less than one year for the cleaner production projects that reduced the waste (IEMP – 1996). In some cases, eco-efficiency might better be termed eco-survival. For example, in India, a scarcity of water and other input materials forced Harihar Polyfibres in Karnataka and Madras Refineries in Tamilnadu to change production processes and increase conservation efforts (Kumar - 1997).

Eco-efficiency, particularly in the area of energy efficiency, will be of critical interest in Asia, where growing energy use is a severe problem and much of industry remains inefficient and wasteful. For example, during the production of products such as iron and steel, cement, pulp and paper and fertilizer, energy requirements are 55 percent higher in China, and 50 percent higher in India per unit of output than they are in industrialized countries (Akiyama & Ishiguro - 1995). For the more industrial advanced economies of East and Southeast Asia, progressive policies eliminating energy subsidies from heavy industry have served to protect the environment. Energy intensities of industry in the high performing Asian economies are mere fractions of those Eastern Europe where the energy subsidies have remained (O'Connor - 1996).

Measurement of different aspects of facility and firm environmental performance is necessary to identify improvement opportunities with a positive economic outcome. Reduced operating costs allow firms to either increase profit margins or reduce prices in competitive markets. Although not all companies agree on the relative value of proactive management of environmental costs, the following quote from Occidental Petroleum's Director of Environmental Affairs is telling:

"Competitive pressures and market forces in the chemical industry have driven out those firms which failed to recognize the true costs of environmental mismanagement. Only those firms that pursue a path of continuous improvement are sustainable in the long run" (U.S. AEP - 1997).

2. *The Right to Know – Government Mandated Measurement and Disclosure Programs*

Most IEPM disclosure programs mandated by government have focused on the collection, organization, and public reporting of industrial releases of toxic chemicals and other pollutants into the ambient environment. In the more highly industrialized countries, such disclosure programs often explicitly acknowledge the public's "Right to Know" about pollutants being released into the environment where they work and live, even if those emissions are legal under existing environmental regulations. From a practical perspective, such disclosure programs recognize the interest of government in countries at almost any level of industrial development in going beyond traditional command and control regulation to promote improvements in industrial environmental performance.

A) *Disclosure of Toxic Chemical Releases*

Most government mandated disclosure of IEPM information in highly industrialized countries has focused on reporting the transfer of toxic chemicals and materials (e.g., persistent organics and

heavy metals) for external waste management (e.g., off-site incineration) or the final release of such materials to the ambient environment. The focus on toxics is partly in recognition of the fact that thousands of toxic chemicals are in commercial use today, and that many of those chemicals are persistent, bioaccumulative, and/or highly toxic, with severe potential health consequences for wildlife and humans alike.

The most well known example of a government mandated disclosure program in the industrialized world is perhaps the U.S. Toxics Release Inventory (TRI), which was developed partly as a response to the 1984 release of toxic chemicals by a Union Carbide plant in Bhopal, India (TRI web site). More than 31,000 U.S. facilities from multiple industry sectors must report their transfers and releases of the 600 chemicals on the TRI list. Despite ongoing debates over TRI's implementation and effectiveness, disclosure of the data clearly has had a big impact on the facilities required to report. A Dow Chemical representative stated in 1991 that "This mandatory disclosure has done more than all other legislation put together in getting companies to voluntarily reduce emissions" (Working Notes - May/June 1995). According to U.S. EPA data, TRI releases dropped by approximately 43% from 1988 - 1995 (NY Times - 1995).

The Agenda 21 plan for the 21st century, developed at the United Nations Earth summit in Rio de Janeiro in 1992, supports the development of national pollutant emission inventories similar to the U.S. TRI. A number of different countries now have varying forms of such "pollutant release and transfer registers (PRTRs)", including Canada, Mexico, Finland, Norway, Sweden, France, the UK, and the Czech Republic (Working Notes - May/June 1993). The details of these programs vary. It is important to note that, although the main component of PRTRs is the reporting of transfers and releases of specific materials, some systems have other reporting components. The U.S. TRI, for example, also requires reporting of on-site waste management activities such as recycling and energy recovery.

The Organization for Economic Cooperation and Development (OECD) has coordinated the development of PRTRs in industrializing regions by coordinating workshops in different parts of the world to introduce PRTRs to interested governments and to provide guidance on system design. In the Asia-Pacific Region, three countries have followed up with more training or formal requests for PRTR implementation assistance: Vietnam, Papua New Guinea, and China. Japan hosted an international conference on PRTRs in September of 1998 (OECD web site) and recently has pilot tested a PRTR for chemical manufacturing firms (Hara - 1998).

B) Beyond Toxics – Other Pollutants and Indicators

In addition to toxic chemicals, there are many other types of industrial pollutants (e.g., more conventional pollutants such as particulates in air) and industrial environmental performance indicators (e.g., record of regulatory compliance) that are of interest to environmentally conscious consumers, environmental NGOs, and neighbors of industrial facilities. These types of indicators increasingly are being made available to the public under government disclosure programs. The Mexican PRTR, for example, includes not only many toxic chemicals but also combustion gases and greenhouse gases (Mexican PRTR web site).

In the U.S. many types of IEPM information, in addition to TRI data, are now available to the general public. For example, U.S. EPA web sites now provide access to databases with information on wastewater discharge permits and hazardous waste generation (Envirofacts web site) as well as regulatory compliance and related data for facilities in key industry sectors (SFIP web site). In recognition of the increasingly important role of information in environmental protection, the U.S. EPA has established a new "Office of Information" that will consolidate existing information related programs and offices from across the agency (U.S. EPA's One Stop web site).

In Asia, Indonesia's National Pollution Control Agency (BAPEDAL) has implemented an innovative reporting, assessment, and disclosure program called the Program for Pollution Control, Evaluation and Rating (PROPER). The first area of performance assessment for all firms is compliance with wastewater discharge regulations. Once a facility has achieved wastewater compliance, it can then achieve higher ratings by going beyond compliance on wastewater discharges, achieving compliance with hazardous waste and air regulations, and implementing cleaner production (Afsah et al - 1997). Although participation in the program is mandatory for the majority of the firms involved, some of the participating firms are volunteers.

In contrast to PRTRs, which typically disclose actual data to the public, BAPEDAL rates facility performance on a five-color scale and releases the ratings to the media and local communities in a simple, comprehensive format. Based on the 187 companies that were involved from the start of the program, the percentage of firms in compliance with wastewater regulations increased from 35.3% to 49.2% from 1995 to 1997. The number of companies implementing cleaner production has grown from 2.7% to 4.3% (BAPEDAL - July 1997). PROPER's results have encouraged several countries to develop similar performance measurement and reporting programs, including Mexico, Colombia, and the Philippines.

Thailand's Pollution Control Department web site allows the user to search for information on industrial facilities that generate air pollution, water pollution, and hazardous waste in each of Thailand's provinces (PCD web site). However, the information generated is limited to the number of facilities that generate each type of pollutant in the province, and the percentage of the nationwide total of such facilities.

C) Summary and Observations

Government mandated measurement and disclosure programs around the world vary in terms of what information is reported, which facilities or sectors are required to report, and the way in which the reported information is disclosed to the public. However, some generalizations can be made. For example, in both industrialized and newly industrializing countries, government mandated disclosure programs to date have focused primarily on the reporting of industrial performance related to discharges of pollutants into the environment. Industrial performance related to ecosystem stewardship and resource consumption typically is not included in these programs.

Other similarities between government mandated programs in industrialized and newly industrializing countries is the focus on the performance of firms in the manufacturing sectors, rather than resource extraction or service sectors, with a few exceptions. Measurement and reporting are facility-specific, which allow the data to be aggregated to higher levels: firm, sector, geopolitical region, geographic region.

Differences in government mandated programs in industrialized vs. industrializing countries also are apparent. For example, in the industrialized countries, the assumption is made that most reporting firms will be in compliance with environmental regulation, and that the disclosure system is intended to drive companies to go "beyond compliance" in reducing pollution levels. In contrast, in less industrialized countries, where compliance with existing environmental regulations is much more problematic, government mandated disclosure may initially serve to bring industrial performance up to the compliance baseline in the first place. The two main examples of government mandated disclosure programs in Southeast Asia, in Indonesia and in the Philippines, do indeed focus on regulatory compliance as the primary indicator of industrial environmental performance.

In the industrialized world, disclosure programs primarily focus on the transfer and release of specific toxic chemicals rather than on releases of more general industrial pollutants (e.g., air particulates or wastewater BOD). This implies that that government and/or the public in these

countries view the specific toxic chemicals as a higher priority than the more general pollutants, or perhaps as less well handled under traditional command and control regulation. Although toxic pollutants also are of concern in newly industrializing countries, and will increase in significance as industrial growth occurs, these countries also are struggling with significant emissions of the more conventional water and air pollutants. Government mandated programs in newly industrializing countries reflect this shift in priorities, as compared to the industrialized world. One example is given by Mexico's inclusion of combustion gases in its national PRTR. The disclosure programs in Indonesia and the Philippines rate facility performance based on compliance with all water regulations, including BOD levels, for example. The focus is not limited to specific toxic chemicals.

3. *Links in a Global Chain – Information Requested by Business Partners*

Supply chain environmental management and the development of environmental performance information specifically for business partners along the supply chain currently is not a widespread component of the environmental activities of industrial firms. However, increasing numbers of large companies are beginning to incorporate environmental performance standards into their procurement and supplier contracts. Similarly, some financial service providers such as investors, banks and insurance companies are starting to set environmental performance standards for industry clients and customers. Numerous factors have motivated this trend, including a desire to reduce environmental risk and costs related to industrial operations and corporate or product image concerns

Supply chain environmental management approaches include environmental "performance" criteria for purchased materials, requirements regarding supplier environmental management systems, and actual operational performance criteria. Some firms make requests for performance information from their suppliers but do not necessarily follow up with specific performance requirements; other firms have explicit requirements and monitor the cooperation of their suppliers. Some customers have formed active partnerships with suppliers to exchange environmental performance information, suggest improvements, and share expertise with environmental and financial benefits for both parties. All of these activities require the measurement and reporting of environmental performance information of various types between industrial firms and their business partners.

A) *Materials Purchasing Criteria*

Some supply chain environmental performance standards are specific to the chemicals, paper, or other materials to be purchased (U.S. AEP - 1997). For example, Japan-based Canon, with Asian facilities in China, Malaysia, Taiwan, and Thailand, has 25 environmental product requirements, including limitations on the use of specific toxic materials of concern. Similarly, NEC Corporation, which has facilities in Asia that purchase locally when possible, lists prohibited chemicals that may not be contained in materials purchased from their suppliers.

In addition to specifying unacceptable materials components, some firms proactively encourage the use of recycled materials in items purchased from their suppliers. For example, Bristol Myers Squibbs (BMS) asks suppliers to reduce raw material use or use recycled materials in preference to virgin materials; local vendors to BMS facilities in Japan, Indonesia, China, Taiwan, the Philippines, Singapore, and Malaysia are included in this effort. One very prominent purchaser in the U.S., the Federal Government itself, has numerous requirements as to the recycled content of paper purchased for government use.

Suppliers who wish to sell their products to firms with purchasing restrictions must provide reliable information so that the customer can assess the environmental "performance" of the material being offered. Premier Group, a Thai company, sometimes uses lab tests and on-site visits to supplier facilities to confirm the product data provided by suppliers, depending on the importance of the product (U.S. AEP - 1997).

B) Supplier Selection Criteria

Although the selection of a purchased material and the selection of a supplier are clearly intricately linked, some supply chain environmental performance criteria focus more on supplier operations than on the purchased material itself.

One of the most commonly requested types of Information on supplier environmental performance consists of queries on the existence and implementation of an Environmental Management System (EMS) at supplier facilities. Management system information gives customers a feel for the long-term commitment of the supplier to environmental compliance and improvement, and the ability of the supplier to deal with problematic environmental issues that might otherwise disrupt the business relationship.

An example is provided by a new Ford facility in the Philippines that has just informed a select group of its primary suppliers that they must adopt an environmental management system in the near future, although Ford has not specified a particular management standard (U.S. AEP Manila – 1999). Another approach, such as that taken by Motorola's Automotive division, is to ask if suppliers have an EMS that is accredited under one of the leading EMS standards, such as the European Union's European Union's Eco-management and Audit System (EMAS) or the ISO 14001 standard.

The International Organization of Standardization is a coalition of standards setting organizations from countries around the world. ISO 14001 is a standard on EMS design, implementation, and continuous improvement, for which companies can receive certification from ISO. ISO 14001 does require measurement of progress towards stated environmental objectives, and will give guidance on environmental performance evaluation (EPE) in ISO 14031. However, ISO 14001 does NOT require any specific level of environmental performance that must result from EMS implementation. The standard has been heavily criticized for this lack of a requirement on performance improvement, as well as the absence of a requirement to disclose performance information to the public, among other things (Benchmark Environmental Consulting - 1995).

As of September 1998, approximately one-third of all ISO 14001 certifications worldwide were by companies in Asia, with the highest number of certifications in Japan (>1200), Taiwan (>300) and Korea (>200) (BATE - July 1998). Much of the enthusiasm in Asia can be explained by sensitivity to potential trade barriers in this region where exports have played an important role in economic development, especially in of the previous success of the ISO 9000 management standard. Nissan, for example, has stated its intention to certify all its own facilities and also will require its suppliers to obtain certification (BATE - Nov 1997). Interestingly enough, however, none of the 30 global firms (24 U.S. based, 6 from Asia) surveyed recently on the topic of ISO 14001 and supply chain management intended to require ISO certification of Asian suppliers (U.S. AEP- 1997).

Government support also plays a role in EMS acceptance by industry. The European Union actively supports EMS adoption. In contrast, in the U.S., the Environmental Protection Agency is delaying pronouncements on EMS efficacy as it conducts ISO pilot tests in collaboration with U.S. states and municipalities. A number of governments in Asia are requiring or promoting ISO certification domestically including Korea, China, Malaysia, Indonesia, and the Philippines.

Some customers go beyond requests for management system information from suppliers; they request information on tangible measures of the supplier's environmental performance achievements. For example, Apple Computer, Inc., which has many suppliers located in the Pacific Rim, requires environmental compliance as part of the business relationship (U.S. AEP - 1997). Some companies are interested in having vendors go beyond compliance. Canon, for example, not

only requires regulatory compliance but also places limitations on supplier uses of certain hazardous substances. Compaq Computer Corporation, which has manufacturing facilities in China and Singapore, requires that suppliers have a waste minimization program with goals and measurement of progress towards those goals. In Indonesia, PT Sri Rejeki Isman Textile won a NATO contract that stipulated pollution avoidance as part of the contract requirement. In response, the firm instituted a waste minimization program that improved its compliance ratings by one performance level in Indonesia's PROPER program (BAPEDAL - July 1997).

C) Collaborative Efforts

In addition to requirements for environmental performance information that allows selection of preferred suppliers, some customer firms are recognizing the potential value of active collaborations, in which the exchange of information between customer and supplier is mutually beneficial from both the environmental and financial perspectives. One proven mechanism is shared savings model that has been widely adopted by the U.S. automotive manufacturing industry (Bierma & Waterstraat - 1997), and is being adopted by some firms the U.S. electronics industry (CSP web site). Firms with operations in Asia also are realizing the value of collaborative supply chain efforts for both environmental improvement and increased profitability. Motorola, for example, described a plan to hold a competition between teams of its Asian suppliers in 1997, the goal of which was to identify ideas for quality improvement, cost savings, and environmental improvement (U.S. - AEP 1997).

Another example of a long-term proactive effort focused on the operational performance of supplier facilities can be found in the Apparel Industry Working Group on the Environment. Members of the group include, among others, Nike, Patagonia, Eddie Bauer, Levi Strauss, and L.L. Bean (BSR web site; U.S.-AEP web site). The member companies are working to assist supplier facilities in Asia, such as textile mills and laundries, to achieve environmentally sound operations. The supplier firms have begun to develop environmental expertise and leadership in their own right. PT. Argo Pantes and PT. Grandtex are examples of two apparel supplier firms in Indonesia that have become "environmental champions", to use U.S.-AEP's terminology.

D) Access to Capital and Financial Services

Every provision of financial services to support economic activity such as project construction, technology development, and industrial operations has environmental consequences, and financial service firms who enable that activity have a great potential influence on environmental outcomes. Both government and the environmental community have become quite interested in persuading banks, insurance companies, investment firms, and other financial service providers to recognize the potential environmental impacts of their financing and asset management practices. The initial focus was on the decision making of multilateral development banks such as the World Bank, which now has integrated environmental indicators into its guidelines on performance monitoring indicators for task managers (World Bank web site). However, the focus is shifting to include private sector financial services organizations and the general investment community.

Many financial institutions such as banks and insurance firms are becoming more interested in the environmental consequences of their business decisions because they are realizing that environmental risk, like all other components of risk, should be assessed and minimized in order to minimize potential financial consequences. Financial consequences of concern include loan defaults by borrowers who have regulatory compliance problems, financial losses due to environmental liability claims, and loss of shareholder value due to environmental problems.

As a result, many institutions are requiring not only environmental assessments of specific investment projects but also general environmental performance information from companies seeking access to capital. Negative environmental performance can result in denial or withdrawal of

financing. For example, in 1996 the Agricultural Bank of China lost approximately U.S. \$1.2 billion on loan defaults due to facility shutdowns triggered by stricter enforcement of environmental regulations. As a result, the bank has started working in co-operation with the Chinese National Environmental Protection Agency to assess firms' environmental risks before making loans (BATE - Dec 1997).

The United Nations Environment Programme (UNEP) has been working with financial institutions (primarily banks) on environmental issues since 1991 and initiated a similar program with insurance firms in 1997 (UNEP web site). Representatives of both industry sectors have signed formal statements that outline the signatories' commitment to sustainable development and the role of the sectors in achieving sustainable development. The UNEP statements recommend that signatory firms periodically report on their own environmental performance. Unfortunately, as of 1995, approximately eight of 130 signatory firms had actually issued free-standing corporate environmental reports (Elkington & Spencer-Cooke - 1996). Since that time, more banks have started to report, and CERES worked with an industry group to develop a standardized report form for the financial services sector. Reporting is increasing in response to a growing public pressure to report their own performance as it relates to their lending and other financing decisions.

UNEP hosted a awareness raising round table for Asian financial institutions in Singapore at the end of 1997. However, currently only five of the over 150 financial institutions that have signed the UNEP statement are from Asia. Three of these are in the Philippines, including the Development Bank of the Philippines and the Land Bank of the Philippines, which now has an environmental unit that scrutinizes all project financing requests (U.S.-AEP web site). Some non-signatory banks in Asia also have activities regarding environmental diligence and responsibilities, including Indonesia's Central Bank, the National Development Bank of Sri Lanka, and the Central Bank of Malaysia (U.S.-AEP web site). Of the 80 insurance companies worldwide that have signed the UNEP statements, only 12 are from Asia, seven of them from Japan.

There are a small but growing number of investment firms that have set environmental and other social responsibility hurdles that firms must pass to be included within investment portfolios. Many of these investment funds were started in order to give socially conscious investors an alternative to traditional funds, i.e., an opportunity to promote social responsibility with their investment dollars. One example is a new fund in Canada called the Sustainable Value Fund, which will invest only in companies that demonstrate a "quantifiable commitment to the environment, economy, and society", and uses quantitative metrics in those three categories, plus general business metrics, to screen firms. The goal is to attract not only socially conscious investors but also profit-conscious investors who may not have a particular concern for the environment (BATE - Sept 1998).

There are also a growing number of organizations that will rate the environmental (and related) performance of firms for those who believe that this performance serves as a proxy or at least a component of financial performance. Much interest has centered on the relationship between environmental performance and financial performance for publicly traded companies. Although the exact causal relationships are not clear, the majority of studies do show a positive correlation between environmental performance and stock value. For example, research from the World Bank (Dasgupta et al 1997) suggests that, among developing countries in South America, and Southeast Asia, the shares of publicly traded companies are affected by environmental performance and reporting.

E) Summary and Observations

Supply chain requirements hold particular promise for promoting performance improvements at the smaller and medium sized industry facilities that serve as suppliers to larger manufacturing and service companies. Industry firms that request or require environmental performance measurement

information from their suppliers predominately request information on the actual materials being purchased, the environmental management system at the supplier facility, or the environmental compliance record of the supplier.

The performance of both small and large firms alike can be influenced by the recommendations or requirements of institutions and investors that provide needed capital and other financial services. Financial service providers query customers about a number of different aspects of environmental performance, depending on the specific financial service being provided. For example, insurance firms that wish to minimize routine claims related to poor environmental performance may be quite interested in details of routine operations at a client facility. In contrast, banks may be more interested in the environmental liability potentially associated with client property used to guarantee a loan.

The influence of supply chain business partners on the environmental performance of industry is still in its early stages in most parts of the world. However, whether voluntary or mandatory, one-sided or collaborative, supply chain activities and performance measurement hold great potential for improving industrial environmental performance in newly industrializing countries where regulatory enforcement, financial and technical resources, and other drivers of performance improvement may be lacking.

4. *Telling it All (?) – Voluntary Reporting of Performance Information*

The level of voluntary disclosure of environmental performance information by industry is growing in response to the steadily increasing demand for this information from the consumers, environmental NGOS, investors, and a variety of other business partners and stakeholders. A small albeit quickly growing number of firms is choosing to disclose environmental performance information via independent environmental reports, the format and content of which is determined solely by the firm. Other companies have chosen to join voluntary reporting initiatives that provide reporting guidelines and/or specific forms. And finally, some companies have elected to promote the environmental performance of specific products or services via voluntary eco-labeling initiatives.

A) *Voluntary Corporate Environmental Reports*

Currently, probably fewer than 1000 firms worldwide produce annual environmental reports, mostly large multinational firms based in North America and Europe (SustainAbility - 1997; UBA - 1997). The content and format of these reports varies widely from firm to firm. Some cover worldwide operations but most cover only domestic facilities. A few reports give facility-specific information, but the majority discuss company operations as a whole giving facility achievements only as anecdotal examples. Most focus on environmental issues with some occupational health and safety information included. A few firms include some level of information on the costs and benefits of the firm's environmental efforts. A few firms are starting to produce "Sustainability" reports, in which the address not only environmental but also economic and social performance issues.

Despite the quickly growing number of reporting firms, the overall numbers are still small in worldwide terms, even among the environmentally conscious business community. For example, of the approximately 2000 companies that have signed the Business Charter for Sustainable Development developed by the International Chamber of Commerce in 1991, less than 10% have produced environmental reports, even though the Charter encourages such reporting. (BATE - Oct 1998). A more common approach for companies not interested in publishing a separate environmental report is to include a discussion of environmental issues and performance in the corporate annual (financial) report.

In Asia, Japanese companies have published the most voluntary environmental performance reports, with Korea in second place. A recent Nikkei survey of Japanese companies found that

approximately 30% of the 227 responding firms had already published an environmental report, and that approximately 40% plan to publish reports by the year 2000. (BATE - Oct 1998) One example of a voluntary corporate environmental report in Southeast Asia is the 1995 report published by San Miguel Corporation in the Philippines (San Miguel - 1995).

A number of organizations have created initiatives to promote voluntary corporate reporting along stated guidelines. One prominent example is the Eco-management and Audit System (EMAS), which is run by the European Commission. A firm that chooses to participate in EMAS agrees not only to adopt an environmental management system and to link actual environmental performance improvements to EMS implementation, but also to publicly disclose environmental performance information. In the U.S. the Coalition for Environmentally Responsible Economies (CERES) is a U.S. based organization that requires signatories to endorse a code of 10 environmental principles and submit an annual report on environmental aspects of their operations, using a standard reporting format designed by CERES. Both the EMAS and CERES reporting frameworks are used by companies in multiple sectors: manufacturing, resource extraction, and the service industries.

The Global Reporting Initiative (GRI) was created by CERES in late 1997 (GRI web site). The dual goals of the GRI are to design standard, globally applicable guidelines for preparing corporate sustainability reports, and to elevate such reporting to the level of general acceptance and practice now accorded financial reporting. The first version of the GRI's reporting guidelines, for use by firms of any industry sector or size, was released for public exposure and pilot testing in March of 1999 and will be revised and re-released in completed form in early 2000. Although the first version of the guidelines has a focus on environmental issues, the ultimate goal is to develop a framework for reporting on the triple bottom line of sustainability. Two of the industry firms pilot testing the GRI guidelines are from Japan, but no others are from the Asia region.

B) Environmental Labelling

Consumer preference for environmentally friendly products is the main driving force behind the success or failure of eco-labeling initiatives. For the most part eco-labeling is undertaken on a voluntary basis and is not required by international standards. Manufacturers usually apply to have a product certified, once it meets the eco-label criteria. Products are usually tested and certified by the eco-labeling organization itself, or through a third party. The label may signify the use of cleaner production techniques, or the use of less polluting material, or the recyclability of the product. General criteria for eco-labeling products depend on the performance or end use of the product, and the processing and production techniques used.

Critics of eco-labeling programs state that such labeling represents a barrier to international trade and have called upon the World Trade Organization (WTO) to regulate eco-labeling. Many NGOs feel that such regulation will water down the effectiveness (i.e. criteria and credibility) of eco-labeling and that powerful business interests in the WTO oppose it simply based on their belief that it restricts the free flow of trade.

Regardless of the WTO's eventual decision regarding the matter, there are many programs in place in Asia, as many countries have begun to recognize that remaining competitive overseas requires improving practices in response to customers' demands. Examples of voluntary government programs include India's Ecomark (1991), Singapore's Green Label (1992), Taiwan's Green Mark (1993), Thailand's Green Label, Japan's Ecomark and Korea's Green Label Program. In some cases, initiatives come from outside the country. For example, Indonesia is a member of the United States forestry program 'Smart Wood'. The program is a NGO initiative that sends in outside experts to evaluate a company's forestry and logging practices. (NWF - 1996).

C) Summary and Observations

The phenomenon of voluntary corporate environmental reporting, both under reporting initiatives such as CERES and independently, currently is occurring only in the more industrialized nations, and for the most part only among very large firms. These firms represent manufacturing, resource extraction, and service sectors. With the exceptions of Japan and Korea, voluntary corporate environmental reporting generally is not occurring in Asia. Some corporate environmental reports issued by large multinational companies do include information on worldwide operations, including facilities in Asia, but most do not report the performance of Asia facilities separately (Cassady - no date). In contrast, eco-labeling has been adopted in a number of countries in Asia, mostly under voluntary government programs.

Voluntary corporate reports and eco-labeling programs play an interesting role in the universe of environmental performance measurement, in that the best examples of each typically are on the cutting edge in terms of the breadth of information reported. For example, these corporate reports often include not only information on pollutant emission EPIs, but also on resource consumption EPIs and even ecosystem degradation EPIs. Many include not only information on internal operations but also on environmental performance related to the product or service provided, as well as information on environmentally relevant relationships with business partners. In contrast, government mandated disclosure programs tend to focus only on pollutant emission EPIs related to internal operations. Similarly, eco-labeling initiatives typically require a broader look at product life-cycle impacts than is required under government mandated disclosure programs.

IV. Considerations in Designing Industrial Environmental Performance Measurement & Disclosure (IEPMD) Systems in Southeast Asia

The following sections outline a number of economic, environmental, political, and societal conditions and trends in various parts of Asia have practical implications, both positive and negative, for IEPMD system design, implementation, and success. The following sections outline some of these considerations.

It is important to note that Asia is a very diverse region with respect to economic development and political systems. The following sections acknowledge this diversity and its implications for not only for how different regions will be able or willing to address environmental issues in general, but also more specifically for IEPMD system design, implementation, acceptability, and success.

1. Multiple & Simultaneous Problems

On the broadest level, most countries in Asia face multiple problems in that they face not only environmental problems per se, but also the urgent need for improvements in socio-economic welfare. In contrast, the more developed nations of the OECD had established reasonable living standards for much (although certainly not all) of their populations when environmental problems were recognized as a serious issue.

The to-date mostly intractable combination of environment-economic-social problems in Asia has significant implications for IEPMD. First of all, industrial environmental performance in Asia should not be evaluated in a vacuum, with no reference to industrial economic and social performance. This implies the need for industrial economic and social performance metrics as well as environmental performance metrics. Going even further, it implies the need for industrial performance metrics that cross the sustainable development boundaries to connect environmental, economic, and social performance. These types of metrics might help to connect and clarify the

goals and activities of government agencies that have typically may have had separate and/or conflicting mandates, e.g., an industrial development agency and an environmental control agency.

With respect to environmental problems specifically, industry is only one of a number of factors that have created the environmental problems facing Asia. Poverty, population growth, urbanization, increasing popularity of personal vehicles, and excessive natural resource extraction all add to the problems with today's environment. Some governments have managed to address individual elements, but tackling all the problems together has proven to be an extremely difficult task. For instance, although in Taipei and Korea there has been minimal attributable environmental damage owing to policies fostering sustainable growth in agriculture and job creation in other sectors, these countries must still deal with escalating population levels (ADB - 1997).

Even restricting attention to industrial environmental impacts, the various impacts are numerous and the root causes of poor performance are complex. For example, the shift from the production of primary commodities to manufactured goods has contributed to the diversity of industrial environmental impacts in the region; added to the ongoing industrial impacts of resource extraction and processing are the impacts of a variety of manufacturing activities. Prioritizing the impacts of most concern and developing potential solutions is difficult. Indeed, the Philippine and Thai governments often have been criticized for failing to prioritize policies and goals, leading to confusion and conflicting measures regarding improvement of industry's environmental performance.

Setting priorities and designing components for an initial (or first few) IEPM system(s) also may be difficult, but a starting point might be areas of industrial environmental impact that have been the most intractable under existing command and control regulations or economic incentive programs.

2. *The Industrial Development Dynamic in Asia*

There is wide variation in the level of industrial development both between and within countries in Asia. The varying levels of manufacturing-industrialization in different parts of Asia will affect the perceived need to measure a particular aspect of industrial environmental performance. However some general observations relevant to most countries in Southeast Asia can be made.

A) *Rapid Growth*

Due to the economic crisis in Southeast Asia, future short-term growth rates in the adversely affected economies can be expected to be quite modest. However, if predictions of long-term recovery hold true, then long-term growth rates will possibly match the projections made in advance of the crisis. The primary source of this expected future growth will continue to be the expansion of the manufacturing sector as well as other types of industry.

Even at slow growth rates, industrial development creates environmental impacts. The rapid pace of industrial growth in Southeast Asia has placed additional stress on the environment. The rapid process also removes the possibility of seeing the consequences of one decision before it is time to make the next. Problems tend to pile up on top of each other; new ones emerging before the previous set has been adequately addressed.

IEPM data typically takes time to collect, analyse, and report, if U.S. and European experience can be taken as a guide. Rapid industrial growth may hinder the review of IEPM data in a timely fashion, i.e., some of the data may be outdated before they are available for planning and decision-making purposes. This has been the case with regulatory decision-making for the rapidly changing pulp and paper industry in the U.S. Thus, in designing IEPM systems in Southeast Asia, special attention should be given to systems that can collect, assess, and disseminate IEPM data in a timely fashion.

B) The Shift to Manufactured Goods as Exports

Despite the diversity between and within countries, it is accurate to say that the high rates of industrial growth in Southeast Asia largely have been driven by the manufacturing sector. For example, in Thailand in the 1960s, primary commodities such as agricultural goods, minerals, and metals represented 95% of products exported. In 1994, the manufacturing sector accounted for over 81% of exports. It is expected that this trend towards semi-skilled manufactured goods will continue to gain importance in the future for both Thailand and the other Second Tier NICs.

The strong trend towards increased manufacturing has heightened awareness of and interest in the environmental performance of manufacturing operations. Indeed, many of the metrics studies ongoing in Asia focus on the development of performance indicators targeted towards the manufacturing sector.

C) Urban Manufacturing Clusters

The growth of mega-urban centers in Asia has implications for IEPM, in that manufacturing firms may cluster near the urban markets, labor forces, and support infrastructures such as transportation, power, etc. Even without industrial activity, the size and density of the population in these mega-cities exacerbates many environmental problems: severe air pollution from concentrated automobile and other traffic; water pollution from the use of surface water bodies as sewers; garbage dumps that threaten the public health of entire neighborhoods.

In contrast to manufacturing industries, resource extraction industries can not co-locate with dense urban populations. The mere fact that manufacturing operations may be more visible than resource extraction activities to significant segments of the population, particularly the educated population, may increase the interest in performance measurement of manufacturing operations as opposed to resource extraction operations. Indeed, the environmental impacts of industrial manufacturing operations in these urban centers make a bad situation worse by contributing pollution to the already overloaded natural systems and increasing the human health risks for many people.

D) High Volume of New Investment

Much of the industrial investment in Southeast Asia over the coming decades will be new investment. This is in contrast to the OECD, where much of the industrial capacity was in place when interest rose in industrial environmental performance. Countries in Southeast Asia must be concerned not only with the environmental impacts of existing industrial operations but also the potential impacts of large amount of new industrial capacity. However, given the certainty of future large amounts of industrial investment in Southeast Asia, it is clear that the new investment should be as clean as possible from the very start.

Some of the opportunities for and barriers to encouraging or requiring environmental performance improvements are different for new industrial capacity than for existing capacity. Similarly, IEPMD approaches to driving improved performance and informing planning efforts may vary.

E) Availability of Advanced Technologies

Because industrialization is occurring later in Southeast Asia than in the more industrialized nations, the benefits of cleaner technology should be readily accessible in Southeast Asia. Instead of being developed in step with industrialization, cleaner technology theoretically has been available from the beginning. Unfortunately, cleaner technologies developed by the more industrialized world and readily available there have not necessarily been readily available to firms in the newly industrializing world, particularly small and medium size firms unaware that the technologies exist at all.

Nonetheless, the potential impact of advanced technologies in Southeast Asia applies not only to manufacturing and other industrial technologies but also to communication, data analysis, and data reporting technologies, both hardware and software. Performance measurement programs being developed in Southeast Asia can take advantage of the newest information technologies, including web access, to collect disparate performance data using integrated systems designed for user-friendly access and data interpretation by multiple stakeholders in industry, government, and the community. Similarly, advanced monitoring and assessment technologies can be used to make actual performance measurements, such as the use of optical sensors that can detect a multitude of chemicals released to air by industrial facilities.

3. *Increasing Globalization*

The international supply chain connections made stronger by increasing globalization and more obvious by high-tech access to information about industry environmental impacts around the world will continually increase the demand for IEPM information from industry in Southeast Asia. For example, the reliance of some industry sectors of Southeast Asian economies on exports requires recognition of the growing preference for environmentally friendly products by global consumers and other customers. For example, the decision of large tropical timber retailers in Europe, such as the B&Q chain, to purchase only timber that has been sustainably harvested attracted the somewhat reluctant attention of tropical timber suppliers in Southeast Asia (Pearce - April 1995). The increasing global preference for cleaner goods holds not only for primary commodities but also for manufactured goods.

High levels of foreign direct investment in Southeast Asia also will increasingly influence the environmental performance of industry firms in the region, as awareness grows of the financial risks associated with poor environmental performance. In addition, growing pressure from an environmentally conscious public in the more industrialized world, including investors, is pushing not only public but also private financial institutions to consider the environmental impacts of their investment and other financial service activities.

On yet another dimension, as concern about global and regional environmental issues grows, domestic and foreign NGOs, and foreign governments, rightly or not, likely will put increasing pressure on Southeast Asian governments and industry to reduce emissions with global impact (e.g., greenhouse gases, ozone depleting substances). Countries and companies that choose to respond by cutting emissions will need IEPM information to illustrate their progress to international stakeholders.

4. *Capacity to Implement and Design IEPM Systems in Asia*

Uneven levels and types of industrialization also imply that public and private sector capacities to deal with increasingly important industrial environmental issues will be uneven. This includes the capacity to design and implement IEPMD programs.

A) *Industrial Capacity*

Apart from Japan and some first tier NICs, the industrialization experience in Asia is quite recent. For example, the second tier NICs industrialized on a wider scale only in the 1980's. Prior to that, the technology was mainly electro-mechanical and only production and assembly technologies were mastered (Mingsarn - 1992). Most of the firms struggle with operative technology, without the capability to develop environmental technology. This is particularly true for small and medium sized firms.

One example of this is illustrated by a project to promote the use of cleaner technology in Thai industry. This project, aimed at primarily small and medium sized enterprises (SMEs), has focused primarily on the food, electroplating and textiles industries, as these are the primary sectors in

Thailand responsible for industrial pollution. Several activities with an emphasis on training, capacity building and technology transfer have been initiated.

However, Thailand's Industrial Environment Institute has stated that success has been limited even after seven years of experience with environmentally sound technology transfer. They attribute this to the passive response from industry, especially the SMEs who still perceive environmental protection as generating unnecessary costs without economic returns. They also note the problem with SMEs lacking the resources to undertake self-starting pollution prevention programs and lacking the initiative to seek external assistance to reduce pollution. Many of them still lack effective environmental management practices and do not have knowledge of basic management and measurement tools (FTI - 1998).

Efforts to promote IEPM in many companies likely will be hampered by the same lack of capacity and interest that has hampered other efforts to address industrial environmental issues. Conversely, IEPM can be viewed as an opportunity to provide firms with the information necessary to convince them of the value of cleaner production approaches, and motivate them to seek external assistance if internal knowledge and experience is insufficient to identify and implement improvement projects.

B) Capacity of Government Institutions

Creating a legislative structure supporting environmental conservation is only one step in the process of minimizing the potential for industry to negatively impact its surroundings. The ability of Asian nations to implement their regulations is the next stage. In response, China, Hong Kong, Japan, Pakistan, Thailand and Vietnam have all formed separate environmental agencies whereas China, Bangladesh, Indonesia, Republic of Korea, Malaysia, Philippines, Singapore have environmental ministries (the countries mentioned twice have both an agency and ministry devoted to environmental issues). In other countries, a division is formed under a separate ministry or in co-operation with another sector to address environmental concerns. For example, in Myanmar the Ministries of Mines, Industries and Agriculture have environment divisions.

Unfortunately, the vast majority of environmental institutions in Asia lack the strength necessary to formulate, implement and enforce the policies necessary for true environmental protection (Brandon & Ramankutty - 1993; Mingsarn - 1996). In addition, the local governments, which are by and large responsible for monitoring and enforcement, do not have the resources and skills necessary to adequately carry out their required functions. Institutional weaknesses of concern include: a lack of financial and human resources; lack of technology; lack of authority; lack of coordination between agencies; and overlapping jurisdictions between agencies. And finally, while government institutions are not incapable of improving the situation on their own, in most cases they are hesitant to solicit support from the private sector or community.

One of the acknowledged benefits of IEPMD systems is the potential to enhance industrial environmental performance beyond the levels achievable with current regulations and institutional capabilities. However, the very institutional weaknesses in Southeast Asia that has made other environmental improvement regulations and initiatives difficult will pose some of the same problems for development and implementation of IEPM systems. For example, in India the central government establishes emissions standards for industry but the state authorities are responsible for enforcement. The result has been regional variance in reporting emissions by plants. These data reporting inconsistencies would affect the accuracy and reliability of any IEPM system to monitor regional or national improvement using these data.

C) General Population (or Community) Capacity

Improved public capacities in the area of cleaner technology and IEPM are also necessary conditions for the incorporation of IEPM into public policies that would enhance environmental improvement. Work by Hettige et al. (1996) in Bangladesh and India found that a community's ability to pressure firms into modifying unsound environmental behavior depends in large part on the communities education levels, literacy rates, resources, influence over government officials and the number of local members employed by the polluting firm. Populations with insufficient levels of education, financial resources, or political clout may not be able to interpret and react to information on industrial environmental performance in a productive way. Concern over this very issue in the U.S. has led to the "Environmental Justice" movement.

The presence of Non-governmental Organizations (NGOs) also can influence the level of involvement and effectiveness of community pressure. The Philippines and Indonesia have a strong network of NGOs whose activities are backed with policy support who are able to increase the likelihood of firms complying with national standards. NGOs are able to educate, organize and inform communities of industry's activities.

Designers of IEPM systems in Southeast Asia that have a public disclosure component should give due consideration to the education and wealth levels of the communities most likely to need IEPM information. For example, Indonesia's PROPER system provides IEPM information to the general public by assigning participating firms to one of five performance categories, each represented by a color, e.g., black, gold, etc. This format is easy for individuals to understand regardless of education level.

D) IEPM Data Availability

Performance monitoring activities and systems in Asia and the performance data collected under those systems reflect the variance among legislation, skilled personnel, budgets and environmental institutions in the region. Backed by ample resources and expertise, countries such as Singapore and Taiwan have highly developed and efficient monitoring systems in place to evaluate firms' activities. Performance data for these systems comes from site inspections by regulators, continuous self-monitoring and recordkeeping by firms, and automated air quality stations. India, Indonesia, and Thailand, although less developed economically compared to Singapore and Taiwan, also have varying types of emissions monitoring systems in place.

Expensive monitoring costs have led many governments to target their pollution reduction efforts on sectors where the most environmental benefit can be gained. The Malaysian Department of Environment has decided to direct its attention on larger firms in the most polluting industries, i.e., the palm oil and rubber industries. This approach has been successful at controlling effluent discharge in these industries and 80% of firms are in compliance. Similar to the approach in Malaysia, the Filipino government selected a more decentralized approach to pollution control and focuses its monitoring efforts on the higher polluting industries.

The World Bank has developed an Industrial Pollution Projection System (IPPS) to allow estimation of pollution profiles for different industry sectors in developing countries, where actual data on pollutant emissions are scarce. (Hettige et al. - 1994). The core of IPPS is a mega-database developed with pollution and manufacturing data from the U.S. These data were used to establish pollution coefficients that relate pollutant output to the level of manufacturing activity, as characterized by either employment level, value added, or output. As these manufacturing data commonly are available in developing countries, use of IPPS allows the translation of this information into pollution profiles. The system has been used to estimate pollution coefficients for Mexico and China, and has been applied in a World Bank Country Study that assesses industrial pollution in Indonesia (Calkins et al - 1994).

IPPS is a noteworthy example of an effort to deal with the lack of industrial environmental performance data in developing countries in a constructive way, i.e., by developing an estimation system based on other data that are available. The developers and users of IPPS, which is based solely on U.S. data, recognize that industrial pollution varies significantly both across and within countries, and are working to characterize those differences to allow adjustment of the system for more accurate results. Envisioned uses of IPPS include estimation of pollution profiles for countries, regions, urban areas, or specific proposed projects.

For a national environmental or industrial development agency that needs to set broad policy priorities and goals, an estimation system such as IPPS could be invaluable. However, no matter how sophisticated the adjustments, it is clear that applying IPPS at the level of the individual facility could be problematic, i.e., the potential for error could be high. For residents of a neighborhood surrounding a specific industrial facility, actual data collected at the facility would be much more accurate and relevant.

5. Public Participation and Information Disclosure in Asia

Public participation in a number of Asian countries has been successful in encouraging or requiring improved industrial environmental performance. For example, local communities in India and the Philippines have utilized the judiciary to enforce environmental regulations and shut down firms who fail to comply with environmental standards. In one case, a Filipino fishing village decided to enforce environmental regulation through legal action after discovering that the activities of nearby industrial developers were reducing fish catches and quality of life. The community applied for a Cease and Desist order from a Filipino court, which stated that the developers must comply with national effluent and emissions standards or face immediate fines or closure.

A recent study of the factors affecting the pollution abatement efforts of paper mills in four Asian countries also illustrates the power of local community involvement (Hartman et al. - 1997). Nine of the 26 mills surveyed in Bangladesh, the Philippines, Thailand, and Indonesia reported pressure from local community groups regarding plant pollution levels and all of those plants significantly increased pollution abatement activities as a result. In the Philippines, local communities, with assistance from the regional offices of the Department of Environment and Natural Resources, serve polluting firms with Cease and Desist orders. Threatened with closure many firms opt to install less polluting equipment (Smith et al. - 1995; Markandya - 1996).

In addition to local community activism, general public awareness of environmental issues can create pressure for improvements in industrial environmental performance. A 1995 Gallup poll on public opinion concerning the seriousness of environmental problems, showed that people in developing countries were cognizant of the environmental problems in their local communities; 43% of respondents cited poor water quality as very serious, and 35% had the same reply for poor air quality. Moreover, higher percentages still saw these issues as being of serious concern in the world and matched in numbers the respondents from industrialized countries (DeShazo - 1997). This trend of increasing environmental awareness makes it likely that the public will have an increasing interest in obtaining, understanding, and using IEPM information to increase their understanding of industrial environmental impacts and support their demands for improvement.

How might the diverse political systems in Asia, which have tended to handle environmental issues in different ways, react to the potential for communities, green consumers, and the general public to impact industrial environmental performance? Non-democratic governments that routinely restrict public access to information, the right to criticize government performance, or to organize public demonstrations likely will be less receptive to performance disclosure programs, one major goal of which is typically to motivate the general public to apply pressure for change. In contrast,

democratic governments in Asia favor public education and relations approaches such as advertising, billboards, meeting, and conferences. The acceptance of the use of social instruments targeted to the shaping of public opinion by Asia's democratic governments could be a significant advantage for proposed industrial environmental performance disclosure programs.

However, even in democratic countries there likely will be some resistance to IEPMD programs. For example, in democratic countries where funds for political support primarily come from large enterprises that may be against increased environmental scrutiny of any kind, industry may play a significant role in determining whether or not IEPMD systems are implemented and the details of programs actually put into place. In addition, the disclosure of actual performance information, rather than just educational information (as important as public education is), can allow the public to base judgement of not only industry performance but also government performance on results, rather than on good words and intentions.

For example, the Malaysian government has stated that it wishes to support action programs that are devoted toward building environmental consciousness at all levels and increase the general public's environmental awareness. To achieve this end, the government supports programs that aim to integrate environmental education into the public school curriculum. On the other hand, there is no Freedom of Information Act in Malaysia and the government often cites the Official Secrets Act as a reason why it fails to fully disclose information. Although the Department of the Environment (DOE) has publicly disclosed some of its monitoring reports on air, noise and water quality and opened its library to the public, full disclosure of information is not persuasive in all government departments. The Nuclear Energy Unit has been accused of withholding information pertaining to a plant suspected of disposing hazardous waste in rivers in Merah. (Singh - 1996).

Nonetheless, reflecting the increasing public awareness of and interest in industrial environmental impacts, governments in Asia are starting to improve public access to environmental information. For example, in Thailand, the new constitution entitles Thais to access to government information. The PROPER and Ecowatch measurement and disclosure systems in Indonesia and the Philippines were designed specifically to harness the power of public opinion and the image concerns of companies to encourage better performance, with seeming success.

Cultural differences between Asian countries may also impact the acceptance and usefulness of IEPMD systems. For example, a general cultural tendency in some parts of Asia to avoid public disagreement and embarrassment, i.e., to avoid situations in which someone could lose "face", may act as a barrier to some models of IEPMD that have been accepted in North America and Europe.

6. The Economic Crisis

The extent of the economic crisis indicates that the Asia that emerges will be recognizably different from the Asia before. For example, a recent assessment by U.S.-AEP indicates that the pollution intensity of industrial water effluent in Indonesia, as characterized by organic content, has increased by 15% since the beginning of the economic crisis. This has accompanied an 18% drop in industrial output by the companies assessed. (Afsah - 1998).

Despite the strong possibility that the crisis will have negative environmental impacts in the hardest hit economies, it is expected that government and private initiatives for environmental spending will be curtailed in the short term. In Thailand, for instance, the budget for environmental infrastructure was slashed by a third by the Office for Environmental Policy and Planning in the wake of the crisis (Asian Environmental Review - 1998). The cut is typical of the response of governments across the region. While foreign aid for environmental projects is not expected to decline, and may increase in local currency terms, there are fears that much of this money could be delayed by state agencies

suffering from liquidity crises. For these reasons, the short-term effects of the crisis on the environment should be expected to be negative.

Environmental agency budget cuts and liquidity constraints resulting from the financial crisis could make it difficult, at least in the short term, to justify funding for design and implementation of an IEPM system. The tendency might be to devote available funds to “action” (e.g., treating wastewater) instead of to “measurement”, which might be viewed as more passive and only of longer-term value, and therefore not as important as an immediate and visible environmental problem that can be remedied. Therefore, the potential for measurement and disclosure systems to promote real action on the part of industry should be emphasized.

Despite the potential for negative environmental impacts as a result of the economic crisis, there may be room for optimism in the longer term. As the economies recover and address the factors that led to the crisis, there may be spillover environmental benefits in several areas.

In the years when the affected economies were enjoying rapid GDP growth, faith in the institutional framework of the countries was solid. The failures have shattered this faith and, as evidenced by the changes of government in Thailand, Korea, and Indonesia in the wake of the crisis, it is apparent that the public demand for improved government institutional frameworks and performance is on the increase. Pressure for more responsible and responsive government will not subside after the economies have healed. People will scrutinize all aspects of government activity more closely than before the crisis, including environmental policies. A system of IEPM that allows the public to monitor the government's effectiveness in handling decisions regarding industrial activities with environmental impacts could be very well received during this period of demand for government transparency and responsibility.

In addition, the increasing desire for transparency of government operations could evolve (or with some active encouragement, be transformed) into a similar desire for transparency of industrial operations, which would translate into an even stronger desire for IEPM information and systems.

The crisis also has elevated the financial/economic concerns of not only individuals who fear job loss and loss of purchasing power, but also companies themselves, in all business sectors. This presents a prime opportunity to deliver the message that cleaner production can be less expensive than dirty production, which may now or in the future require expensive pollution control equipment. An IEPM system that includes a financial component (e.g., tracking the cost to industry, government, & society of pollution control) might be well received in the wake of the current economic crisis.

V. General Recommendations IEPMD Systems in Southeast Asia

Following are some preliminary recommendations for policy makers interested in developing and implementing industrial environmental performance measurement and disclosure systems in Southeast Asia. These are general recommendations rather than specific program proposals in acknowledgement of the fact that different regions of Asia, with a diversity of environmental problems, levels and types of economic development, political systems, societal capacities, and cultural traditions will need or want a variety of different types of IEPMD programs.

1. Measure the Performance of both Resource Extraction and Manufacturing Sectors

Most of the recent performance measurement and metrics studies that have been carried out by government and industry in Asia have focused on the environmental performance of the

manufacturing sectors, including: electronics, food processing, paper manufacturing, building & construction, chemicals manufacturing, auto manufacturing, power generation, steel manufacturing, and printing. Such studies have been done in both more industrialized Asian countries such as Japan (Hara - 1998), Korea (Sung - 1998), Singapore (Raghavan - 1998), and Taiwan (Wang - 1998) as well as in newly industrializing countries such as the Philippines (Silverio - 1998) and Thailand. The government mandated performance disclosure programs in Indonesia and the Philippines have also focused on manufacturing firms.

The recent focus on environmental performance measurement for manufacturing firms is understandable, in view of the rapid growth of the manufacturing sector in Asia. Manufacturing impacts are of particular concern in growing urban centers, where high population densities are potentially exposed to the pollutant emissions from nearby manufacturing operations, and where manufacturing pollution in general adds to the already overwhelming and very visible ecosystem degradation.

The popularity of the ISO 14001 environmental management standard with the many manufacturing firms in Asia that export their products probably also explains some of the recent interest in performance indicators for the manufacturing sector. ISO 14001 certification requires the measurement of facility progress towards stated environmental objectives, and ISO 14031 gives guidance on measurement approaches.

Despite the serious and growing problem of environmental impact from the manufacturing sectors, industrial resource extraction activities such as mining and logging are still ongoing in Asia, and may have even increased in some areas in order to supply the growing manufacturing sector. However, despite the serious environmental impacts of extraction activities, the development of environmental performance metrics for the resource extraction sectors has not been given much attention.

Some of the work done on manufacturing sector performance measurement can be extrapolated to resource extractions industries, but specific metrics for extraction activities are also necessary. For example, pollutant emission EPIs generally are relevant to both manufacturing and resource extraction sectors. In contrast, ecosystem stewardship EPIs, which characterize the non-pollutant environmental impacts (e.g., soil erosion, habitat destruction) of industrial activities, would be more relevant to resource extraction firms than to manufacturing firms. Integrated extraction/manufacturing operations such as some pulp and paper firms would be interested in EPIs relevant to both types of operations.

Design of IEPM systems in Southeast Asia should focus not only on critical pollutant emissions, but also on resource consumption efficiencies and habitat degradation resulting from industrial land use. Despite the reluctance of some government agencies to disclose environmental performance information for some resource extraction activities (Severino - 1997), measurement of the environmental performance of resource extraction industries is critical for long-term sustainability.

2. Use Indicators that Link Environmental Performance to Economic Performance

Because economic development and environmental improvement go hand in hand as critical goals for most of Southeast Asia, it is imperative that industrial environmental performance be linked to economic performance whenever possible. Particularly in the final stages and aftermath of the economic crisis, facility and firm level environmental indicators that incorporate financial considerations can deliver a powerful message to industrial firms reeling from the business impacts of the crisis. Integrated environmental/economic indicators on a more macro scale can assist government policy makers in making and justifying decisions in situations when environmental and economic priorities might otherwise conflict. Integrated indicators might also make it easier for

multiple government agencies to connect and communicate about their different economic and environmental mandates.

The link between environmental performance and economic performance can be either positive or negative, depending on the particular situation, and the point of view of different stakeholders. For example, the cost of installing expensive pollution control equipment causes many industry representatives to view environmental improvement efforts as economic losers. The environmental engineering firm hired to install pollution control and treatment equipment, on the other hand, reaps economic benefits. Stakeholders in the local community might view pollution control expenditures as an investment that reaps positive economic (and other) returns, even if the return on investment is difficult to quantify.

Both the negative and positive elements of the environmental/economic performance relationship can be used to motivate environmental performance improvements on the part of industry facilities and firms. For example, industry firms or sectors might be more likely to improve environmental performance if they believe they some day might be held accountable for remediating ecosystem damage caused by their operations.

A recent Asian Development Bank study recently developed national level estimates of the “cost of remediation” for a specified level of environmental improvement in a number of different countries in Asia (Jalal & Rogers – 1997). The indicator included both the costs for “green” remediation of land and ecosystems as well as the costs of “brown” remediation, i.e., air and water pollution control efforts. For most of the countries studied, the study found that the remediation costs for repairing land and ecosystem damage (to some reasonable extent) was much larger than the cost of brown remediation efforts related to pollution control measures. From this perspective, investments in pollution control (or other environmental improvement efforts) and treatment look economically more attractive than the potential alternative. This applies to resource extraction and manufacturing firms, although resource extraction sectors might be particularly interested due to the land-intensive nature of their operations.

However, pollution control and treatment is not the only approach to improving ongoing industrial operations. Cleaner production approaches such as raw materials substitution and process efficiency improvements may not only allow a reduction or avoidance of expensive pollution control technologies, but also can increase the efficiency of raw materials and energy use by the firm. The firm reduces not only raw materials and energy purchase costs but also reaps the financial benefits of using all production inputs such as labor and capital to make product rather than pollution. For the quickly growing manufacturing sector in Asia, it is critical to characterize the potential positive economic benefits of superior environmental performance, above and beyond avoided pollution control costs.

Governments and manufacturing companies in Asia already use integrated economic/environmental metrics to a certain extent. For example, Japanese companies in several manufacturing sectors report the level of investment in environmental facilities, research, and development as an indicator of their commitment to environmental improvement (Hara - 1998). In Singapore, industrial performance indicators at the company level traditionally have been expressed in terms of the annual number of non-compliance incidents, the annual waste treatment and disposal cost, and the financial value of non-compliance penalties per year (Raghavan - 1998).

A few companies in Asia also are beginning to use metrics that explicitly connect positive environmental performance with positive economic outcomes. For example, one Japanese beer company (Kawaguchi - 1999) measures not only its waste treatment costs but also the revenues received from reuse and recycling activities. One company in Korea has developed an aggregate

environmental performance indicator that takes into account, among other things, the financial savings resulting from proactive environmental management (Sung - 1998).

Not all indicators that connect environmental and economic performance need rely on financial metrics. Eco-efficiency indicators typically measure quantities such as the amount of waste generated per unit product, or the amount of raw material used per unit product. The value of the raw materials going out the door as waste rather than product is implicit in these indicators. Some of these metrics are generally relevant to many industry sectors. Others may be designed for specific industry sectors. For example, the Industrial Technology Development Institute in the Philippines suggests a number of water-related eco-efficiency metrics specific to food processing operations, which are large water users (Silverio - 1998).

Eco-efficiency indicators of this type take the focus off of expensive end-of-pipe control and treatment technologies as the preferred method of environmental performance improvement. As such, they hold great promise for aligning the economic and environmental interests of firms, thus motivating industry facilities, companies, and sectors to improve their environmental performance voluntarily rather than because of regulation or public pressure. Much work is ongoing in Asia on defining eco-efficiency metrics, although different names may be used. Taiwan, for example, uses the term cleaner production metrics to emphasize the role of cleaner production in achieving improved eco-efficiency (Wang - 1998).

3. *Develop Indicators for New Industrial Investment*

Much of the industrial investment in Southeast Asia over the coming decades will be new investment. It is critical to ensure that this new investment is as environmentally friendly as possible from the very start, considering the multiple complexities of and barriers to promoting environmental improvement once industrial operations are already in place. Therefore, approaches to IEPM must be developed for measurement of the expected environmental performance of new industrial development.

In the U.S. and Europe, much of the industrial capacity was in place when industrial environmental performance became a concern. Therefore, the first step in measuring performance was the characterization of the environmental performance of the "dirty" baseline operations or technology. In contrast, much of the new investment expected in Southeast Asia will not have such a clear baseline to measure from. One possibility is to measure the performance of new investment as compared to the average performance of existing industrial capacity in the same industry sector. However, if the average performance of existing industrial capacity is poor, this makes a poor baseline in terms of encouraging new investment to be as clean as possible.

A better option might be to compare the predicted environmental performance of the new investment technology to the "best available technology", from an environmental perspective, that is available on the market at that time. Selection of best available technologies has been the U.S. EPA's traditional approach to setting emissions standards for new facilities; installation of the designated best technology is not mandated, but the technology that is installed must meet the same environmental performance requirements as the best available technology.

Challenges to this approach include differing definitions of "best" and "available" among multiple stakeholders. For example, a high performing technology that has been implemented and proven at only a few industrial facilities may not be acceptable to more risk averse industry colleagues. One technology with minimal wastewater generation, a desired environmental performance feature, may generate substantial air emissions, a negative feature. Nonetheless, one could envision a modified system that ranks production technologies into environmental performance tiers that could

be used to rate the predicted environmental performance of a new industry facility or other operation. Separate tiers could be developed for key expanding manufacturing sectors.

Assuming that a method or methods for measuring or ranking the various aspects of environmental performance of available technologies is in place, such a system should be used not only to characterize the environmental performance of a proposed new investment. It should also be used to characterize the more indirect, yet critical, role of government and private sector institutions that enable new investment to be put into place.

One important “enabler” of a new industrial investment project is the finance provider: the bank, be it public or private; the investment or insurance firm; the venture capitalist, etc. The community of investment finance providers is a particularly important group to involve in IEPM efforts in Southeast Asia. This sector is probably unique in that it can influence the environmental performance of its *customers* by attaching environmental performance conditions to its financing agreements. In view of the economic crisis in the region, financial services firms may be more interested than previously in assessing the environmentally related financial risks of potential investments as part of a generally stronger desire for minimizing risk of all kinds.

Government itself is another potentially important enabler of new industrial investment. In addition to public development banks, economic development agencies can promote new investment via tax holidays and other incentives. Government plays a role not only in encouraging specific investment projects but can also encourage or discourage new investment in entire industry sectors.

The environmental performance of investment finance providers, government ministries and agencies, and other significant enablers of industrial activities should be measured in Southeast Asia, particularly in regards to new investment. Are private banks assessing the potential environmental performance of new industrial investments they are financing? Are economic development agencies targeting less-polluting industry sectors for investment incentives? Are they targeting industry sectors that will use scarce natural resources efficiently, or perhaps not at all? Such indicators can illustrate to the public government's dual interest in and promotion of both the environmental and economic pillars of sustainable development.

The performance of government and the financial services industry can also be measured in terms of their influence on the environmental performance of existing industry facilities, firms, and sectors. However, characterization of their performance with respect to new investment will be particularly important in Southeast Asia.

4. Harness the Power of Public Pressure

In the absence of sufficient government capacity or resources to adequately enforce environmental regulations, public pressure from local communities and environmental NGOs, as well as market pressures from environmentally conscious consumers can provide the needed leverage to persuade industry facilities and firms to improve their environmental performance. However, in order for public pressure to be effective, information disclosure is necessary.

One general avenue for increasing the disclosure of industrial environmental performance information to the public might be to increase the quality, comparability, and visibility of such data via existing public participation mechanisms, as opposed to creation of new disclosure programs that may meet political resistance. The institutionalization of the PROPER disclosure program in Indonesia was speeded up in this way, via becoming an extension of an existing clean river program (Afsah & Vincent - 1997).

One existing avenue for consideration is eco-labeling, which is targeted towards green consumers. The lack of green consumerism in Asia has been a major contributor to the ongoing business and industrial degradation of the environment (UNEP - 1996). Yet, this trend appears to be changing with a heightened awareness of environmental impacts on the part of individuals, perhaps partly attributable to the increase in press coverage, with articles on environmental issues more than doubling (from 140 to 350) between 1986 and 1996 (DeShazo - 1997). Many Asian countries have eco-labeling initiatives, and if rising consumer awareness strengthens the value of these programs, they may become a more promising avenue for disclosing the environmental performance of consumer product firms. However, as long as these programs remain voluntary, focused primarily on consumer products, and with varying standards from country to country within Asia, their ultimate value is unclear.

Another existing avenue for consideration is the Environmental Impact Assessment (EIA). A number of Asian countries have implemented measures that require EIAs for industrial activities. The Philippines system has been in place since 1978 and requires EIAs for heavy industry projects, resource extraction and large-scale infrastructure works. Public hearings can be held depending on the size of the project and the natural resources involved. (Smith & Van der Wansem - 1995). The EIA process in Thailand ensures that information is made available to the public prior to final decisions, which gives them an opportunity to take action. Depending on the size and scale of the proposed project, both local communities and environmental NGOs may take part in EIA review processes.

Unfortunately, EIAs in Asia are often carried out to support development rather than environmental protection objectives by not fully accounting for the damages and the required mitigation. However, one ongoing controversy in Taiwan illustrates the power of community groups and environmental NGOs to use the very inadequacies of the environmental performance information contained in a very poor EIA to significantly hamper (and perhaps eventually stop) a large industrial investment project.

An EIA disclosure mechanism would be of the most value for new industrial investment, the potential environmental of which, as discussed previously, are indeed of critical concern in Southeast Asia. But what about public disclosure to drive performance improvements in existing industrial operations? There seem to be no routinely accepted existing mechanisms for disclosure of the environmental performance of existing industrial facilities and firms. However, a widely accepted mechanism that might be accessed to promote voluntary disclosure on the part of firms is ISO 14001.

There is considerable controversy about whether or not ISO 14001 certification will promote actual environmental performance improvements, since it does not require such improvements. However, a recent survey of ISO certified firms in Thailand, mostly manufacturers, revealed that most firms achieved improved environmental performance on multiple levels as well as economic benefits from their efforts. In addition, 40% of the respondents reported fewer "complaints" and 98% reported an improved company image. It is reasonable to suppose that these firms will be willing to publicize their positive results via voluntary disclosure of performance information. Such reporting is already happening in Japan and Korea, two Asian countries with high numbers of ISO certified firms.

Unfortunately, if experience parallels that of the more industrialized nations, voluntary corporate reporting may remain limited to very large firms with the resources to produce such reports and the image concerns of a high visibility organization. In addition, until some reasonable standard exists for corporate environmental reporting, the variation in the format and content of these reports and issues of credibility may limit their usefulness. For the longer term, the ISO 14031 guidelines on Environmental Performance Evaluation and the Global Reporting Initiative Guidelines hold the most promise for standardization of voluntary reporting.

Thus, government mandated disclosure programs seem to hold the most promise for the widespread dissemination of industrial environmental performance information about existing industrial operations. Despite differences in environmental and economic priorities, technical capacities, political systems, and cultural mores, the experience with design and implementation of performance disclosure initiatives in the more industrialized nations does provide some useful lessons for such initiatives in Southeast Asia. For example, years of critiquing, improving, and expanding the Toxics Release Inventory and other disclosure initiatives in the U.S. have provided many valuable lessons regarding data integration, accessibility, and interpretation.

Nonetheless, it is critically important to take local priorities and conditions into consideration when designing systems in Asia. The PROPER program in Indonesia provides the most comprehensive example of a carefully planned information disclosure system that was designed with local realities in mind. Multiple data sources were utilized to minimize potential errors, including data sources independent of firm reporting to enhance data credibility. A simple color-based rating scheme was chosen to make the results easily understandable to the general public. The initial focus was on wastewater discharge performance since the sponsoring agency had the most data and experience in that realm of environmental performance. A six-month grace period for performance improvements was given to poor performers between the initial ratings and public disclosure since this was new program to which facilities were not yet accustomed.

The success of the PROPER program and its continuing expansion into other aspects of industrial environmental performance bodes well for government mandated disclosure initiatives in Southeast Asia. In the early stages of implementation, such programs in Southeast Asia should have modest goals to allow time for necessary capacity building and to ensure some early successes that will support plans for future expansion and new programs.

In general, is likely that initial programs will focus on the internal operations of industrial firms and the pollutant emissions that result from those emissions. However, in order to avoid a simple repetition of the learning curve in the more industrialized countries, including the mistakes and problems experienced there, even the early, more modest disclosure systems in Southeast Asia should be designed with specific goals for future expansions in mind. This will allow Southeast Asia not only to avoid simple repetition of previous programs, but to leapfrog those programs and advance best practices for industrial environmental performance disclosure. It will also put industrial firms on notice to start planning for continuous rather than one-time improvement in environmental performance.

5. Use Trade Association and Supply Chain Measurement to Reach SMEs

Small and medium sized firms (SMEs) are difficult to regulate and difficult to provide with technical assistance and information because of sheer numbers and low visibility compared to larger firms. One possible route to promoting improved environmental performance on the part of SMEs is through industry trade associations. Another promising avenue is through SME suppliers and customers.

Trade associations can encourage improved member performance by setting industry-wide goals for performance improvements, elucidating the potential economic and image benefits to member firms, and providing access to technical and other information. For example, the electronics association in the Philippines has a long-term goal that all members will eventually obtain ISO 14001 certification (U.S.-AEP web site). Trade associations can encourage individual firms to report environmental performance data and then use that information to provide an industry benchmarking service for their members. Industry-wide performance information gathered in this manner can benefit not only individual industry firms, but also the sector as a whole in terms of

environmental image. In addition, such information can inform government planning and policy making with respect to SMEs.

The environmental performance of SMEs also can be influenced by the requests or requirements of important customers. In general, the customer firm is motivated by risk avoidance or reputation and image considerations. In Southeast Asia, this mechanism seems to be led by multinational firms with Asian operations and suppliers, but could be extended to large firms based in Southeast Asia.

The potential for environmental performance improvements in this arena is as great for service sector firms as for manufacturing firms. For example, telecommunications firms do not generally sell a concrete product, and therefore would not be able to focus on product performance in the same way that a manufacturing firm would. However, telecommunications firms such as telephone service providers do purchase materials such as electronic equipment, metal furniture, etc. from multiple suppliers, whom they can influence with purchasing and supplier selection decisions. Of necessity, however, this mechanism will only succeed with large firms that already have made some progress with their own environmental performance issues.

6. *Develop a Common Language and Framework*

Just as comparability and clarity in the realm of voluntary environmental reporting can be confused by the lack of a standardized reporting framework, the usefulness of other IEPM systems and information can be limited by a lack of coordination among the multiple parties promoting and implementing IEPM in a region. For example, the varying industry sectors and toxic chemicals covered under the PRTRs in the U.S., Canada, and Mexico currently are being compared in order to see if it is possible to assess the level of toxic chemical releases for the region as a whole.

In order to promote or at least enable the usefulness of IEPM information at multiple geopolitical/economic levels (e.g., municipal, national, ASEAN-wide, international), geographic levels (e.g., watershed, airshed), and temporal levels (e.g., annually, cumulative), a common language and framework for IEPM among ASEAN members would be advisable. For example, along the lines of the U.S. EPA's Facility Identification Initiative (FII), preliminary agreement on how to identify different industry sectors, sub-sectors, and facilities consistently would greatly enhance the potential comparability and compatibility of data collected by different countries and different regions or organizations within countries.

The various sector-specific IEPI studies underway in Hong Kong, Japan, Korea, the Philippines, People's Republic of China, Singapore, Taipei and Thailand should serve as valuable case studies for other sectors and countries in the region. Consensus on key IEPM and IEPI issues as revealed by these country studies could be particularly useful in promoting consistent practices throughout Southeast Asia. Coordination of Asia-specific practices with international initiatives, such as the Global Reporting Initiative (GRI), would be particularly useful in this era of increasing globalization.

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